

A model curriculum of health care informatics for Dutch higher professional education

Jos Aarts, Causa, Hogeschool Eindhoven, Eindhoven, The Netherlands

This paper describes the results of a two year project to design a model curriculum of health care informatics for Dutch higher professional education. The core of the curriculum are sixteen modules which cover the broad range of medical informatics and which are closely related to the profiles of the professions involved (nursing, physiotherapy, speech therapy, occupational therapy and dietetics). The curriculum emphasizes the need of using structured data and information to perform tasks in health care delivery and management, for which modern information technology is indispensable. The model curriculum will enable faculty to redesign existing undergraduate programs and to select the contents they see appropriate. In this way we hope that the model curriculum will contribute to an innovative attitude of future graduating health care professionals. A new three year project just has started to develop learning materials using professional health care software based on the sixteen modules of the curriculum.

INTRODUCTION

For over a decade health care informatics has received considerable attention in Dutch higher education. Since 1984 the Dutch government has funded several small scale pilot projects to implement courseware, application and simulation programs in higher education [1]. Also teaching programs were launched to educate faculty of Dutch higher education institutions about the application and use of information technology in health care. In 1987 a subcommittee of the Royal Dutch Academy of Sciences chaired by Jan van Bommel made recommendations to strengthen the position of medical informatics as a pre-condition to innovate medical education, to improve research activities and to further the efficiency of patient care [2]. The report of the committee paid also attention to the position of higher professional education which is organized separate of universities in the Netherlands and especially advocated more co-operation between schools of nursing and medical schools.

After 1990 rapid changes in health care and higher professional education prompted the Dutch government to take a different approach and to support more large scale programs to implement health care informatics in undergraduate education. It was in this context that Causa, the innovation center of the Hogeschool Eindhoven for informatics

in social work and health care, has been awarded a contract to develop a model curriculum of health care informatics in 1993. The project has been carried out in joint collaboration with departments of the Hogeschool van Amsterdam, the Hogeschool Nijmegen and the Hogeschool Eindhoven. These three schools offer a complete range of undergraduate professional programs in higher health care education (i.e. nursing, physiotherapy, speech therapy, occupational therapy and dietetics). The result of the project has been a publication of a book, in which the curriculum is described extensively [3].

THE CURRICULUM

The curriculum is based on three principles.

- It must do justice to the profiles of the health professions involved.
- It must cover the important issues of health care informatics as much as possible.
- It must allow for integration into the existing courses of the undergraduate programs and not increase the study load of these programs and/or prompt the need for specialist health care informatics courses.

The model curriculum emphasizes the need of health care informatics to understand better and define the health care information process in order that appropriate activities can be chosen for computerization [4].

The model curriculum has been designed on the basis of professional scenario's, the informatics competencies derived from the scenario's and a health informatics classification model.

Contributing authors were asked to describe in a scenario how the five professions involved would look like in five years from now and to derive from that the informatics competencies that graduates must possess. The scenario's were based on adopted profiles and legal regulations concerning the practicing of health care delivery and on European Union agreements concerning the mutual recognition of higher education diploma's and practice certifications. Also taken into account were expected shifts in the level of health care practicing. For example, nursing baccalaureate graduates are expected to perform more tasks at a managerial level, while day to day care tasks will be more delegated to nurses with a vocational background. This development will make an increased demand on the judgement and decision making skills of baccalaureate nurses.

The informatics competencies could be derived from the professional scenario's. This assured us that competencies were linked to the tasks these health care professionals were expected to do. The competencies were very much modeled after the results of the IMIA Working Group 8 Nursing Informatics Task Force meeting in June 1987 [5]. To ensure that the appropriate range of health informatics would be covered we used the Van Bommel application classification model [6]. We expanded this model with two axes. The vertical axis represents the health care environment in which applications play a role, the forward pointing axis represents methods required to develop and use applications. Examples of the former are government and institutional health care policy, management issues, using the health care process model, etc. Examples of the latter are methods to develop informatics applications, issues of structuring and classification of health care data, clinical decision making, etc. The horizontal axis represents the relation between the level of applications and the complexity of human tasks as described by Van Bommel [6]. We dubbed this expanded model the 3D-Van Bommel model.

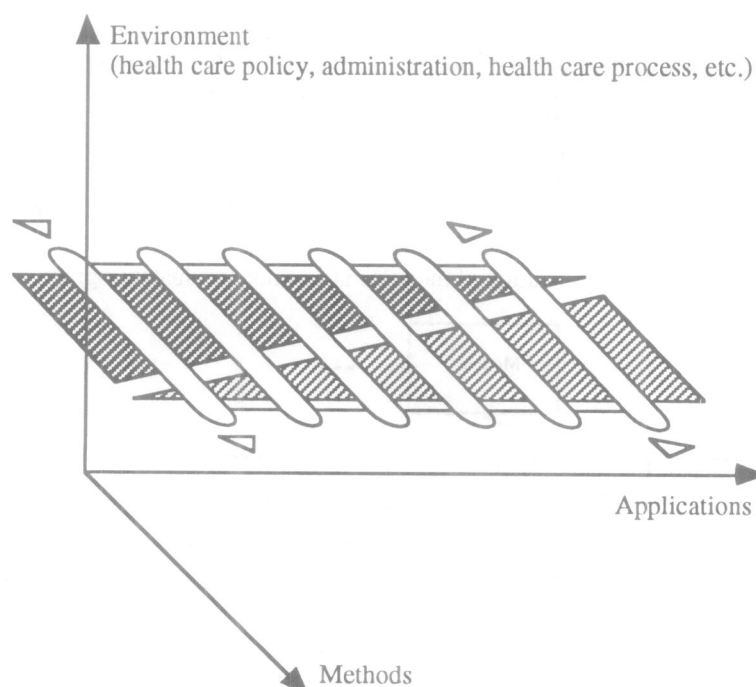
The professional scenario's, the informatics competencies and the 3D-Van Bommel model allowed us to identify sixteen modules which form the core of the health care informatics curriculum. The following modules have been described.

- 1 *Health policy and information needs.* The module deals with government and societal policy concerning health care and the

information needs that arise from it. Health professionals are required to collect a vast amount of data and communicate it to the appropriate authorities and government bodies.

- 2 *Administration and information requirements of health care institutions.* This module draws attention to the role of information systems in health care institutions, and ways to design and implement them.
- 3A *Informatics and practice of nursing.* This module centers around the core of nursing practice and the role of informatics. The same applies to:
 - 3B *Informatics and practice of physiotherapy;*
 - 3C *Informatics and practice of speech therapy;*
 - 3D *Informatics and practice of occupational therapy, and*
 - 3E *Informatics and dietetics.*
- 4 *Clinical decision making.* The module is focusing on the modeling of decision problems using formal methods like decision tree analysis.
- 5 *Structuring and classification of health care data.* The development and implementation of classification systems in health care are central to this module.
- 6 *The electronic patient record.* In the Netherlands the electronic patient record has gained considerable interest. A large number of the Dutch GP's utilize some form of the electronic patient record and several initiatives have been launched to introduce patient cards [7].
- 7A *Management issues in nursing.* This module

Figure 1: The 3D-Van Bommel Model



pays attention to the difficulty that modern nurses have in running their wards, planning and budgeting and the supportive role of informatics.

- 7B *Informatics and practice management.* A major number of the Dutch physiotherapists and speech therapists still have private practices. Informatics plays an important role to support their tasks in care delivery and care administration.
- 7C *Logistics of dietary service.* Taking the distribution of food as a starting point this module generalizes into the important role of logistics in health care and the role of modern information technology.
- 8 *Integration of knowledge and experience in clinical practice.* In this way the role of knowledge based systems and decision support systems is addressed. Also access to a diversity of information and knowledge resources is part of this module.
- 9 *Patient education.* Multimedia technologies are an important focus of this module which is dealing with the question how patient behavior can be supported by modern instructional technologies.
- 10 *Informatics and the disabled person.* The last module examines the use of modern information technology allowing handicapped citizens to participate in society.

It can be seen that some modules bear relevance for a certain professional group. But the aim has been to describe the modules such that they can be used in a broad range of undergraduate programs. The study load per module (lectures, assignments, computer lab) varies between 40 and 120 hours.

IMPLEMENTATION

As mentioned before we consider integration of the model curriculum into existing undergraduate courses a prime condition for wide acceptance of health care informatics by students and faculty. Teachers can make a selection from the modules. Some modules are a prerequisite for successful

completion of others. For example, knowledge of the contents of module 1 and 2 are necessary to understand the content of modules 3A, 3B, 3C, 3D or 3E (depending on the undergraduate program). Modules 1 and 2 could be part of a second year course on health care policy and the functioning of health care institutions, while module 3A could be implemented in a nursing process course. Other modules could be part of elective courses. Figure 2 shows how the modules can relate to each other. We assume that students possess the necessary skills to use computers and the most important standard software applications. An implementation can be successful if following conditions are met.

- Faculty leadership (dean and other administrative officials) must be convinced of the importance of informatics for professional practice. Leadership must create a framework that allows for continuous innovation of undergraduate programs.
- Faculty that will be teaching the contents of one or more modules need to be knowledgeable and, if they are not, educated about the concepts and applications of health care informatics.
- Learning materials, including software applications, must be available for students and faculty.
- Learning materials should be flexible in use for students and faculty. The teacher must feel free to add his own material and he will be serviced with advice how to use and expand the material.

Table 1 shows in which undergraduate programs the modules could be implemented. The model curriculum helps faculty to identify what contents could be applicable for their undergraduate programs. For that reason each module does not contain only a description of the subject, but also learning goals, estimated study and teaching load and advice about software that can be used.

The authors of the different modules advise mostly the use of MS-DOS™ and MS-Windows™ based software. However, we do not advise specific

Figure 2. Organization of modules in an undergraduate program

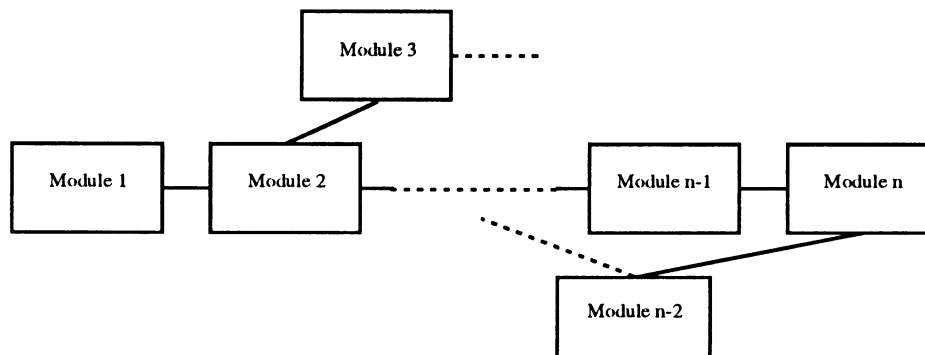


Table 1. Applicability of health care informatics modules in undergraduate programs

Nursing	Physiotherapy	Speech therapy	Occupational therapy	Dietetics
1	1	1	1	1
2	2	2	2	2
3A	3B	3C	3D	3E
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7A	7B	7B	7A	7C
8	8	8	8	8
9	9	9	9	9
	10	10	10	

equipment. Rather we emphasize the need for a computer network infrastructure that allows access to various information resources and applications including via the Internet. Most Dutch higher education institutions have embarked on long term investment schemes for advanced IT-infrastructures [8].

FOLLOW-UP

The completed model curriculum of health care informatics must be considered as 'raw material'. It only outlines the contents, learning goals, learning activities and possible software applications. It is of little value when it is not supported by learning material for use by students and faculty. Experience shows that development of learning materials is a time consuming process and has gradually become a professional activity of its own right. Based on the results of the project described in this paper Causa has been awarded a three year project funded by the Dutch ministry of education to develop learning materials. The learning materials will be based on the sixteen modules described and supported by professional health care software which will be adapted for educational use. Agreements have been made with private vendors to make applications available for the project. The material will consist of theory, teacher and student guidelines, case histories which will be partially implemented in the software applications together with appropriate data sets. It must be emphasized that we do not wish to replace existing textbooks, but wish to create a new learning environment for health care informatics that will stimulate innovation of higher professional education and practice.

References

1. Aarts JECM. Development of nursing process CAI using the TAIGA authoring system. In: Salamon R, Blum BI, Jørgenson M, eds. Medinfo 86. Amsterdam: North-Holland, 1986:900-902.
2. Van Bommel JH, Festen CMAW. Medische informatica - vernieuwing in de geneeskunde (Medical informatics - innovation in medicine). Amsterdam: Koninklijke Nederlandse Akademie van Wetenschappen, 1987.
3. Aarts JECM, ed. Een leerplan informatiekunde in de gezondheidszorg voor het HGZO (A curriculum of health care informatics). Utrecht: Uitgeverij Lemma, 1995.
4. Aarts JECM. Towards a founding principle of nursing informatics. In: Wainwright P, ed. Nursing informatics. Edinburgh: Churchill Livingstone, 1994:1-16.
5. Peterson HE, Gerdin-Jelger U, eds. Preparing nurses for using information systems: recommended informatics competencies. New York: National League for Nursing, 1988.
6. Van Bommel JH. A comprehensive model of information processing. Meth Inform Med 1983;22:124-130.
7. Van der Lei J, et al. The introduction of computer-based records in the Netherlands. Ann Intern Med 1993;119:1036-1041.
8. Verreck WA, Slotman RH, Van Osch MER, eds. Nieuwe wegen, nieuwe grenzen - hogescholen innoveren met informatietechnologie (New roads, new boundaries - professional schools innovate with information technology). Den Haag: Hobéon Media, 1994.